

15 Digestion: An Absorbing Tale



Your digestive system is responsible for both mechanical and chemical breakdown. Everything you eat and drink, including medicines, enters your body through this system. You can probably name a lot of the organs that food passes through, such as the esophagus, stomach, small and large intestine. There are other organs, however, like the liver and pancreas, which help your digestive system work even though food does not pass through them. What happens as food and other substances travel through your body?



CHALLENGE → How does your digestive system work?

MATERIALS



For each student

Student Sheet 14.1, "Your Digestive System," from Activity 14

1 Student Sheet 15.2, "Talking Drawing: Digestion"

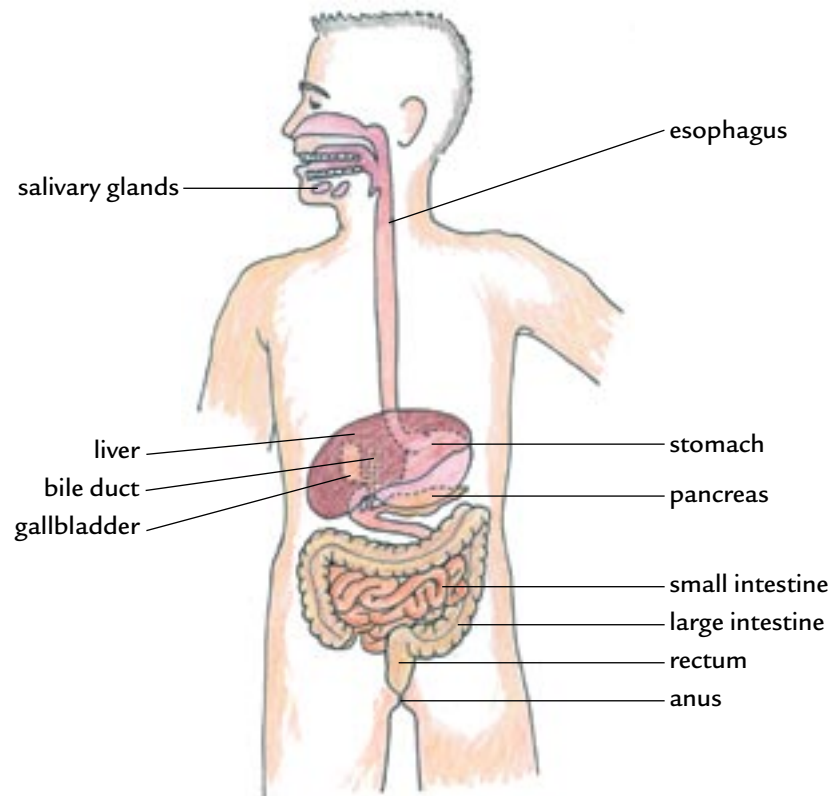
READING

Food Breakdown

Take a moment to look at the diagram of the digestive system below. You can think of your digestive system as a long tube that goes through your body. Food is absorbed along this tube. If your body didn't absorb what it needed from the food you eat, everything you swallow would come out the other end! You know that doesn't happen. But do you know why? What are the functions of each part of your digestive system?

The digestive system breaks down food into forms that the body can absorb. This breakdown occurs two ways—mechanically and chemically—and it begins in your mouth. Your teeth begin the process of mechanical breakdown. Chemicals in your saliva begin the process of chemical breakdown.

As you swallow, food travels down through your esophagus (ih-SAW-fuh-gus), which is a tube surrounded by muscle. This muscle contracts to help food reach your stomach, a large bag-like organ. Muscles in your stomach wall help to mix the stomach contents. This continues the process of



THE HUMAN DIGESTIVE SYSTEM

mechanical breakdown. In your stomach, hydrochloric (hi-druh-KLOR-ik) acid—one of the acids used in science laboratories and industries—and other chemicals continue the chemical breakdown of food. The hydrochloric acid in your stomach is so powerful that your stomach is lined with mucus to protect itself. When this lining is absent, ulcers (sores in the lining of the stomach) can form. A high level of hydrochloric acid causes the burning sensation you may feel when you vomit or have indigestion.

STOPPING TO THINK 1

- How does your mouth contribute to the process of digestion?
 - Explain how your stomach helps break down food.
-

By the time food reaches your small intestine, you wouldn't recognize it anymore! It is a thick pasty mixture. Your small intestine then completes the process of chemical breakdown with help from your pancreas (PAN-kree-us) and liver. As food comes into your small intestine from your stomach, it contains high levels of acid. Your pancreas produces a chemical that reduces this acid level. It also produces chemicals that help break down the proteins and fat found in food. Your liver produces bile, an important mixture that helps break down fat. All of these chemicals combine with the partly broken down food as it travels down your small intestine.



A doctor who specializes in stomach and intestinal problems is called a gastroenterologist (GAS-tro-en-tuh-RAH-luh-jist).

Absorption of Nutrients

Another important process happens in your small intestine, where most of the substances produced by the breakdown of food are absorbed into your blood. After food is completely broken down, we call the pieces **nutrients** (NEW-tree-unts). In the process of **absorption** (ub-SORP-shun), nutrients leave your digestive system and move into your blood, which carries nutrients to the rest of your body. Nutrients are required by all the parts of the body, not just the stomach. The blood acts as the transport vehicle after the stomach has digested food, producing nutrients for all parts of the body.

STOPPING TO THINK 2

- Explain the relationship between food and nutrients.
 - What role(s) does your small intestine play in digestion?
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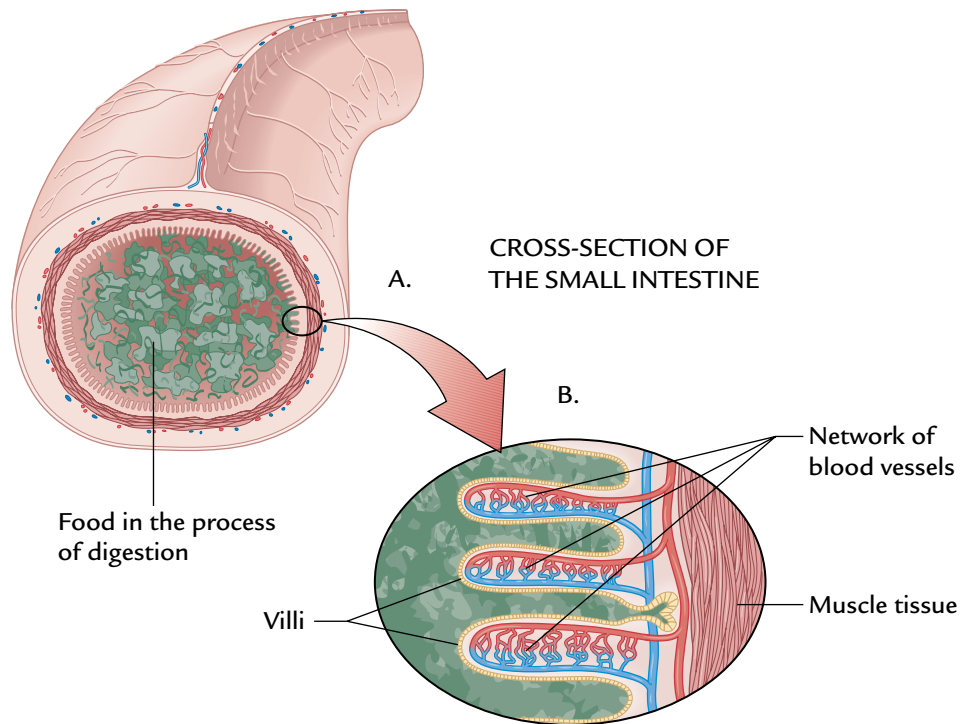
The fact that most of the final breakdown and nutrient absorption occurs in your small intestine may help explain its length. The average adult small intestine is 5–6 meters (about 15–18 feet) long! This length, plus the folds in the wall of the small intestine, shown below, provides lots of surface area for nutrient absorption. Your blood transports these nutrients to different parts of your body, but first it makes an important stop.

All of the blood that leaves your stomach and intestines goes directly to your liver before traveling throughout the rest of your body. This is because your liver performs two important functions related to digestion, besides producing bile. First, it breaks down toxins such as alcohol and some medicines. (Your blood is later filtered by your kidneys, which excrete liquid wastes and some dissolved toxins as urine.) Second, it processes nutrients into forms that are easier for the rest of your body to use. For example, your liver stores carbohydrates. When you suddenly need energy, it converts these carbohydrates to sugars that your body can use.

STOPPING TO THINK 3

Why does blood travel to your liver before transporting nutrients to other parts of your body?

Nutrients are absorbed by the blood across the wall of the small intestine. Fingerlike projections from the wall of the small intestine are known as villi (VIL-eye) (singular, villus). Nutrients must pass through villi and the walls of tiny blood vessels to enter the blood.



Getting Rid of Solid Waste

Any material that has not been absorbed by your small intestine continues down into your large intestine, or colon (KOLE-un). In your large intestine, large quantities of water and some remaining vitamins are absorbed into your blood. The remaining unabsorbed material forms a solid waste as it travels through the large intestine, a process that can take 18–24 hours. This solid waste is stored in the rectum (REK-tum) before being pushed out through the anus (AY-nus). What is this solid waste made of? It contains bacteria, substances that your body can’t digest, and some remaining water. Bacteria live and grow in your intestines, and they help you in several ways. They break down some plant material that your body can’t break down on its own, they make vitamin K, and they help prevent harmful bacteria from finding a home. The trade-off for providing a home for these helpful bacteria is the gas and odors they produce.


STOPPING TO THINK 4

The reading describes three components of human solid waste. Which two of these do you think are the main components?

ANALYSIS

- 1. What are some of the functions of the digestive system?
- 2. Copy the table below. Then fill in the table by placing an “X” to indicate the function(s) of each organ. The first row has been done for you.

Functions of Digestive Organs					
Organ (or structure)	Mechanical breakdown	Chemical breakdown	Nutrient absorption	Water absorption and solid waste production	
Mouth		X	X		
Stomach					
Small intestine					
Pancreas					
Liver					
Large intestine					

3.  Imagine taking a bite of a burrito. Follow the beans in the burrito through the process of digestion. Explain what types of changes take place and where each change happens.
4. Most substances are absorbed in the small intestine and not in the stomach. Aspirin is a common exception; it is absorbed in the stomach. Some alcohol is absorbed in the stomach, but most is absorbed in the intestine.
 - a. Why would you want medicines, like aspirin, to be absorbed in the stomach instead of the small intestine?
 - b. What is the effect of some alcohol being absorbed in the stomach?
5. Copy the lists of words shown below:

List 1	List 2	List 3
pancreas	liver	chemical breakdown
stomach	pathway for food	small intestine
esophagus	esophagus	saliva
digestive organs	stomach	teeth
heart	large intestine	pancreas
gallbladder	small intestine	liver

- a. In each list, look for a relationship among the words. Cross out the word or phrase that does not belong.
- b. In each list, circle the word or phrase that includes the others.
- c. Explain how the word or phrase you circled is related to the other words on the list



6. Take a closer look at the villi of the small intestine (part “B” in the diagram, “Cross-Section of the Small Intestine”). How do the villi help nutrients move into the blood quickly?

Hint: What would happen if there were no villi, only a smooth surface?



EXTENSION

To find out more about food and nutrition visit the *Issues and Life Science* page of the SEPUP website.